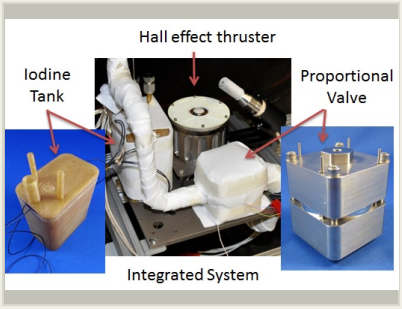
High Performance Iodine Feed System, Phase II

Completed Technology Project (2016 - 2018)

Project Introduction

Busek is developing an advanced iodine feed system for Hall Effect Thrusters (HETs), ion engines, cathodes, and other plasma generators. The feed system features an innovative piezo driven valve that saves volume, mass, cost, and energy with respect to state of the art alternatives. The feed system also features a low mass plastic propellant tank that may be manufactured through additive processes. This allows low cost, complex shapes that can maximize the use of available space inside volume-restricted spacecraft. The feed system will be especially attractive for small spacecraft and CubeSats. Iodine stores as a solid and sublimates at modest temperatures as the molecule I2, which allows many benefits with respect to traditional Hall effect thruster fuels such as xenon and krypton. These advantages include higher storage density, lower storage pressure, the ability to test high power systems at space-relevant conditions in modest facilities, the capability to store propellant in space without active regulation, and the capacity to transfer propellant at low-pressure conditions in space. In a space-limited spacecraft, using iodine instead of state of the art xenon could increase available delta-V by a factor of three (3) or more. In Phase I, Busek developed a feed system featuring the advanced components, which was integrated into the iSAT spacecraft form factor. The system was then tested with an iodine compatible Hall effect thruster in relevant space conditions. In Phase II, an improved feed system will be designed, built and tested. Major Phase II technical objectives include developing an engineering model iodine resistant, piezo driven flow control valve, finalizing the feed system control architecture, identifying and evaluate commercial components to fill out the system, and building and characterizing the system. At the conclusion of the Phase II effort, engineering model valves will be delivered to NASA for further characterization.



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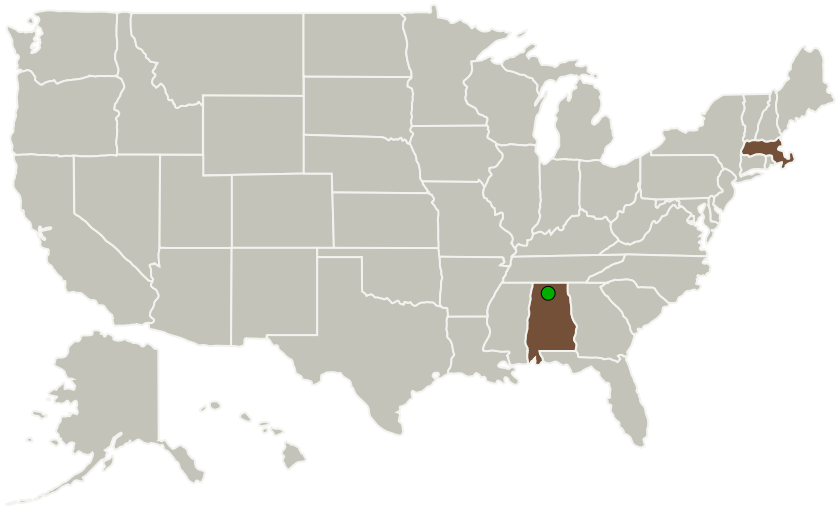
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Busek Company, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Natick, Massachusetts
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Massachusetts

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Busek Company, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

James Szabo

Co-Investigator:

James Szabo

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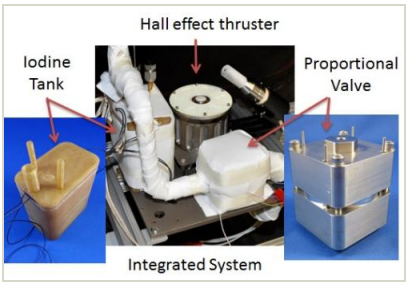
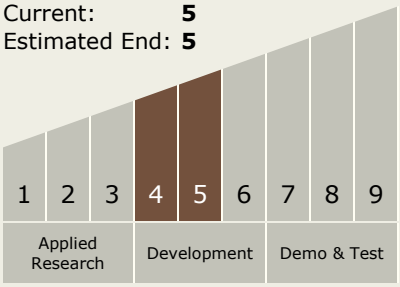
Images



Briefing Chart Image
High Performance Iodine Feed System, Phase II
(https://techport.nasa.gov/image/134722)

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System